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Coordinating Energy Efficiency Project Evaluation with Voluntary Emission Reduction Registration

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Background

There is increasing interest in many states, the U.S. generally, and internationally in

- quantifying air emission reductions associated with energy efficiency and renewable energy projects/programs, and
- registering these reductions on emission reduction registries.

This can represent a relevant and timely combination of performance measurement for environment and energy initiatives.

Objectives for the presentation

- Describe how efforts to measure energy impacts of efficiency projects can be coordinated with state-level voluntary emission reduction registries

More specifically…

- Describe how greenhouse gas (GHG) source energy efficiency projects can be evaluated in a manner that can meet require-ments of these registries (and internationally tradable credits)
- And, how to document energy impacts with specific attention
  to requirements for baseline and post-installation data

M&V for energy-efficiency performance

The evolution and success in measuring and verifying (M&V) energy-efficiency performance has made it possible to reliably quantify energy savings for facility-specific projects.

- Using standard M&V protocols such as the International Performance Measurement and Verification Protocol (IPMVP), performance contracts are routinely used as a means for structuring financial arrangements that are dependent upon verification of energy savings attainment
- Current M&V protocols also include a version of the IPMVP specifically designed for and applied to U.S. federal facility projects (FEMP–Federal Energy Management Program, M&V Guidelines: Measurement and Verification for Federal Energy Projects,
  Version 2.2, 2000)

Environmental “performance”

Also advancing over time are NOx and SOx trading markets in the U.S. and emerging carbon trading markets, particularly in Europe.

- In the U.S. there are numerous voluntary emission reduction registries seeking to join the international efforts to reduce greenhouse gas (GHG) emissions.
- In addition, the (draft) Greenhouse Gas (GHG) Protocol Project Quantification Standard has been developed as a quantification protocol and likely prerequisite for internationally tradable emission reduction credits.
- The protocol—which is used as the basis for an example application in this presentation—is being developed jointly by the World Resources Institute and the World Business Council for Sustainable Development (with USEPA input).

Combining energy & environmental M&V protocols

The key practical challenge is to *combine* aspects of the two
M&V protocols in a cost-effective manner, while retaining the
rigor and integrity of each.

- As the steps of each protocol are outlined in this paper, we will attempt to note where some cycling back between steps is necessary to minimize M&V costs.
- The specific example of energy savings and emission reduction calculations presented in this paper is based on an actual project—Wisconsin's statewide public benefits energy efficiency (EE) program.

The basic elements…

Calculating total emission reductions from energy efficiency projects involves

- summing ***electricity savings*** (and/or on-site fuel savings,
  e.g., natural gas), and then
- multiplying those savings by ***emission factors*** to produce pounds of emissions saved or avoided.

For our purposes, the emission factors are expressed as *pounds of pollutant per MWh of electricity* or *per therm of natural gas* (more on this to follow).

In its basic form, calculating emission savings is…

Energy saved * Emission factor = Lbs. of pollutant avoided

The fact that the formula requires two independent estimates, *energy savings* and appropriate *emission factors*, is why we argue that <u>two</u> protocols should be applied to make the strongest case for certifiable emission credits

Estimation of the energy saved

The first protocol addresses M&V to reliably estimate the size
and reliability of the “energy saved” portion of the formula

- Especially in federal energy management projects—the preferred protocol is the IPMVP (FEMP version)
- The most important concept in this protocol is that energy savings are equal to “baseyear” energy use minus post-
  project energy use *plus or minus adjustments*

What are “adjustments?”

Adjustments are crucial in order to account for changes in facility energy use that are not related to the energy efficiency project

- For example, changes in plant production associated with energy use, but also affecting the change from baseyear use
  to post-project use)
- The IPMVP adjustments are designed on a project-specific basis to “normalize” baseyear and post-project energy use data ***to a common set of conditions***

Steps in the IPMVP (including the FEMP version)

See International Performance Measurement & Verification Protocol: Concepts and Options for Determining Energy and Water Savings, Volume 1, March 2002, obtainable at www.ipmvp.org

Pre-retrofit steps…

1. Gather baseyear data
2. Design the energy efficiency project (e.g., retrofits) and the M&V plan
3. Document the M&V plan with baseyear data (energy use and pertinent facility operational data)

IPMVP project implementation steps

4. Complete the energy efficiency project
5. Install any measurement equipment, as per the M&V plan
6. Gather post-project data (energy and operational) as defined in the M&V plan
7. Maintain measurement equipment and data outputs
8. Make an non-routine baseline adjustments required
9. Compute and report savings as defined in M&V plan.

The M&V plan

For developing the M&V plan, which is essential to the protocol, the IPMVP offers three basic options regarding how to set boundaries around the energy efficiency project and what measurements are needed for computing savings.

These options include:

(1) savings are determined by measuring energy use of the system(s) that are retrofitted;

(2) a whole building option where savings are determined by measuring energy use a the whole facility level; and

(3) calibrated simulation, where savings are determined by a computer simulation of energy use before and after the project.

IPMVP certification, and likely costs

In order to be recognized as IPMVP-compliant, a Certified Measurement and Verification Professional would typically be involved with the project (a specialist certified by IPMVP through
a training program and exam conducted by the Association of Energy Engineers)

- Though ***costs*** for conducting the M&V to establish energy savings varies by project, the IPMVP suggests a rule of thumb regarding costs for IPMVP compliance…
- Typically it would not be expected that average annual savings determination costs would exceed about 10% of the value of the average annual energy savings being obtained

So, we have the “energy saved”…

Now we need ***emission factors***

- The EPA and others have produced emission factors for each state (e.g., for our example of Wisconsin)
- These factors are typically calculated as an average of all emitting generators in the state or region (excluding, for example, hydro and nuclear)
- However, it is important to use emission factors that take into account one important aspect: given the relatively small size
  of energy saved from either specific projects (or even statewide programs), their impact on generators is likely to be felt at the ***margin***, rather than having an effect on base-load plants *(see discussion in paper)*

Registering emission reduction credits with registry

Typical criteria for registering emission reduction credits with a state registry:

(remembering it is important to be aware of specific eligibility criteria for the registry that you would like to have recognize your emission reductions—e.g., California Climate Action Registry, or Wisconsin's Voluntary Emission Reduction Registry)

(1) *The emission reduction must be voluntary and not required by law*

(2) *The voluntary emission reduction must result from an action to reduce emissions*

A second protocol for quantifying the GHG reductions

For this we recommend the GHG Protocol Project Quantification Standard being developed as a quantification protocol (and likely prerequisite for internationally tradable emission reduction credits) by the World Resources Institute and the World Business Council for Sustainable Development

- As the developers of this protocol emphasize, it is essential that the specific requirements of the trading market (termed the “external program”) are determined and adhered with in order for the Project Quantification Standard to be correctly applied
- This will apply also to voluntary registries (e.g., California Climate Action Registry)

The GHG protocol involves eight (8) steps

Step 1: Describe the project(s) and primary effect(s).
What are the specific changes in emissions that a project is designed to achieve?

- In the case of Wisconsin's programs, the reductions in purchased electricity use by end users are a primary effect. These are almost exclusively indirect effects because the GHG sources—the power generating plants—are not owned by the end user.

Step 2: Check the eligibility of the primary effect with the criteria of the appropriate market.

- This step is relevant if the project is being done for an external program, such as a market-based mechanism (e.g., the Chicago Climate Exchange)

The concept of “additionality”

Step 3: Check that the primary effect is additional to legal requirements.

- This step applies an initial additionality screen—is the project being undertaken simply to come into compliance with applicable laws, codes or regulations?

Step 4: Preliminary evaluation of secondary effects.

- This step involves a quick early assessment of any potentially significant negative secondary effects—increases in GHG resulting from the project that would undermine the reductions attributable to the primary effect

The baseline…

Step 5: Select the baseline scenario.

- This step involves selecting a baseline scenario and emissions for the primary effect(s), and it is crucial because the project's GHG reduction is calculated as the difference between the project and baseline emissions
- Various approaches can be used depending on the external program/market – for grid-connected electricity projects it is typical that a project-specific baseline will need to be estimated and independently verified
- **This is a critical step – but it is the step that is accomplished by implementing the IPMVP protocol**

Almost done…

Step 6: Identify and assess relevance of secondary effects.

- This step is a more thorough analysis of secondary effects, and is informed by the baseline scenario selection (Step 5) and associated emissions.

Step 7: Calculate the project reduction and classify based on ownership.

- This calculation step expresses the project's GHG reduction

  on an annual basis, either in terms of carbon/year or CO2 equivalent—for a grid-connected EE project
- As an example, the calculated results for Wisconsin's C&I programs are shown in Table 1, next slide.

Emissions Savings, Program to Date (April 2001–December 2003):

C&I Program	Verified Net		Emissions Reductions (Pounds)*			
	MWh	Therms	CO2	NOx	SO2**	Mercury
Commercial	60,129	2,412,971	172,561,482	408,957	649,542	2.242
Industrial	100,260	6,603,042	317,932,039	707,693	1,083,202	3.738
Industries of the Future	14,262	1,235,975	48,698,921	103,635	154,101	0.532
New Buildings	143	18,049	554,518	1,096	1,545	0.005
Production Agriculture	14,262	120,185	35,637,003	92,482	154,042	0.532
Renewable Energy	0	1,662,468	19,464,174	16,625	100	0.000
Schools & Government	23,627	2,050,508	80,711,542	171,716	255,292	0.881
Total C&I Programs	**212,683**	**14,103,197**	**675,559,679**	**1,502,204**	**2,297,824**	**7.929**

Finally, a monitoring plan…

Step 8: Develop a monitoring plan.

- The protocol focuses on before-the-fact assessment (ex-ante)
  – if the project is being undertaken to seek credits in a GHG program/market, verified ex-post measurements will be needed
- This step therefore defines the parameters and indicators that need to be tracked over time to calculate actual GHG reductions
- **Again, if the IPMVP protocol has been conducted this monitoring plan will have already been accomplished.**

Some concluding thoughts

There is an additional benefit for project sponsors to begin now
to carefully quantify indirect emission reductions—whether for state-level voluntary registries or potentially tradable credits.

- As multi-pollutant legislation moves forward at the federal level, Congress will need to make decisions on how to allocate the credits initially.
- This posed a difficult equity issue in 1990 in the creation of the SO_2 cap-and-trade system, and the same equity issue will loom even larger when more pollutants are considered
for stricter controls.

Concluding thoughts (continued)

The 1990 legislative history shows that Congress did a fairly good job at recognizing the efforts of those states (and utilities) that had already made efforts to reduce SO_2 emissions (i.e., Congress required smaller cuts from the "early adopters").

- Congress will likely do the same under new multi-pollutant legislation: states that can demonstrate that they took action early to reduce SO_2, NO_x, mercury, and/or GHG emissions
  will be able to make a strong case to receive initial allocations of pollution credits that reflect those efforts.

Concluding thoughts (continued)

A primary objective of this presentation has been to argue that whether for state-level voluntary registries or potentially tradable credits, a strong verification and documentation of savings protocol based on international recognized monitoring and verification programs *will ensure recognition of environmental benefits realized by projects.*

And, there is *positive public relations value* for participating federal/state agencies (or defense industry companies) through the registering of emission reduction credits and related accomplishments, fact sheets, case studies, press releases, etc.